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## (54) Data communication

(57) A system for communicating output information 812, relating to a plurality of different type events, e.g. money market transactions, from one or more uniquely identifiable local data bases 814 at which the output information is initially collected, 816, to a remote back office data base is disclosed, in which data may be requested from a local data base in order of events independently of the type of events involved. Each of these types has an associated field list which uniquely defines the transmission format of the information although the request 800, 804, 806, for the information is by a unique "ticket" identifier which is independent of the type and comprises the unique identification of the local data base which is the associated terminal controller and the sequential number corresponding to the order of confirmation of an event at the particular local data base. The local data base also stores a status record which changes with each change in the number of confirmed events. By requesting this status record with automatic updates, the remote back office database can be advised that additional confirmed events have occurred and can request updates without the need for continual polling.

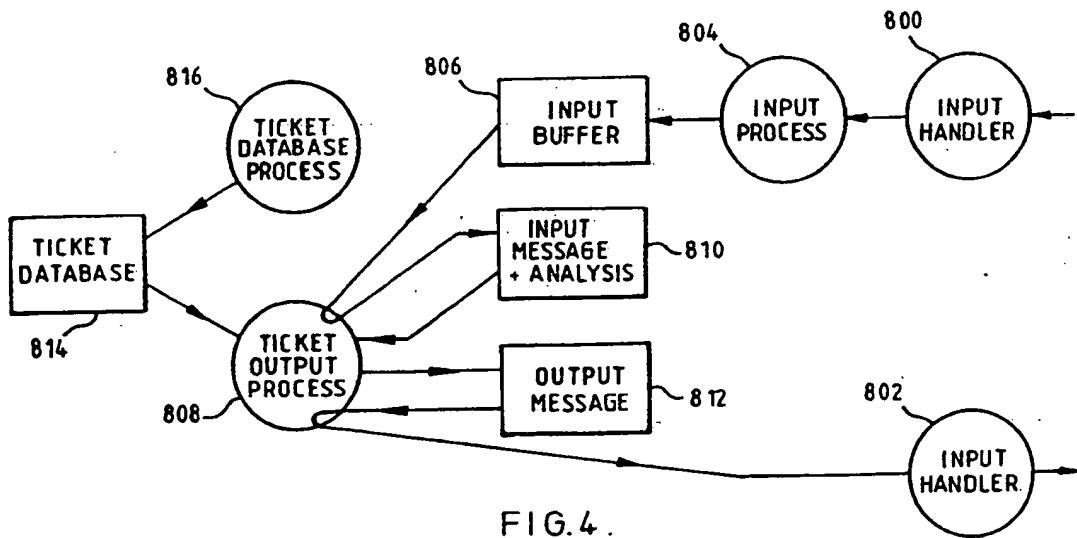


FIG. 4.

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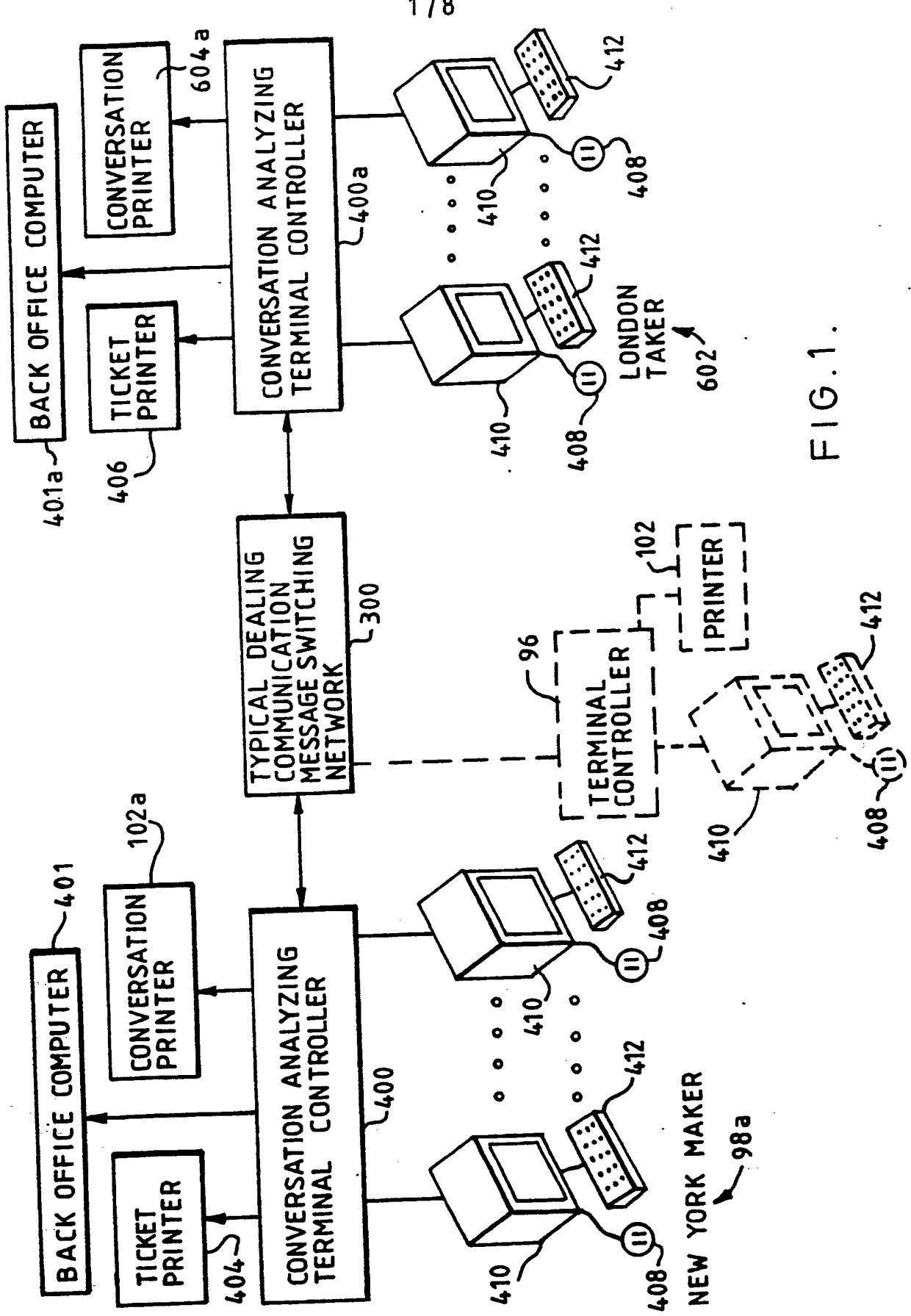


FIG. 1.

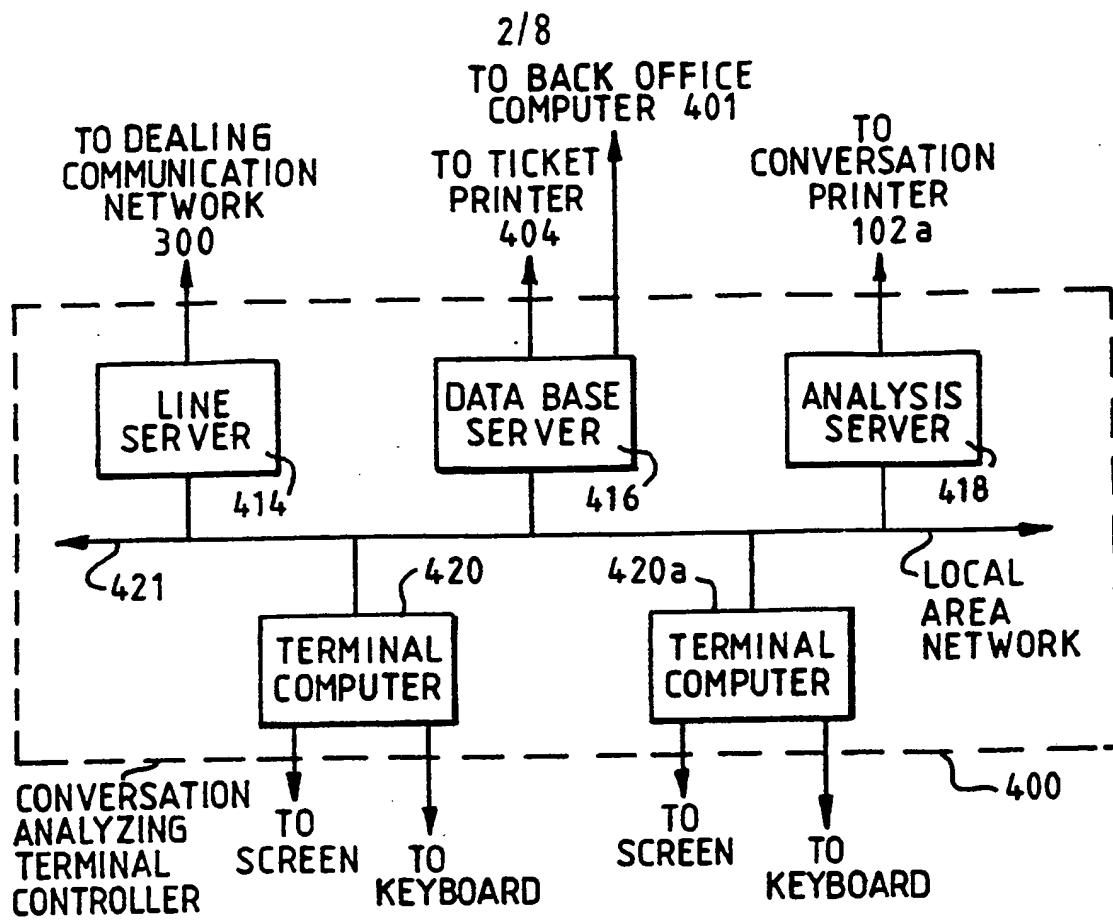


FIG.2.

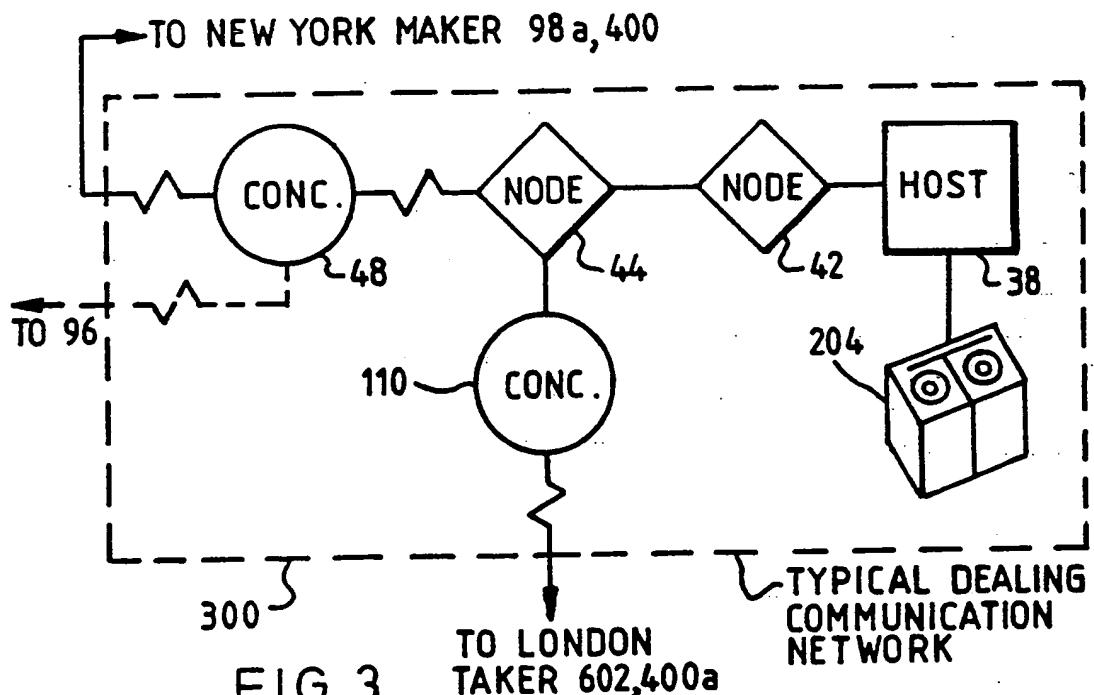


FIG.3.

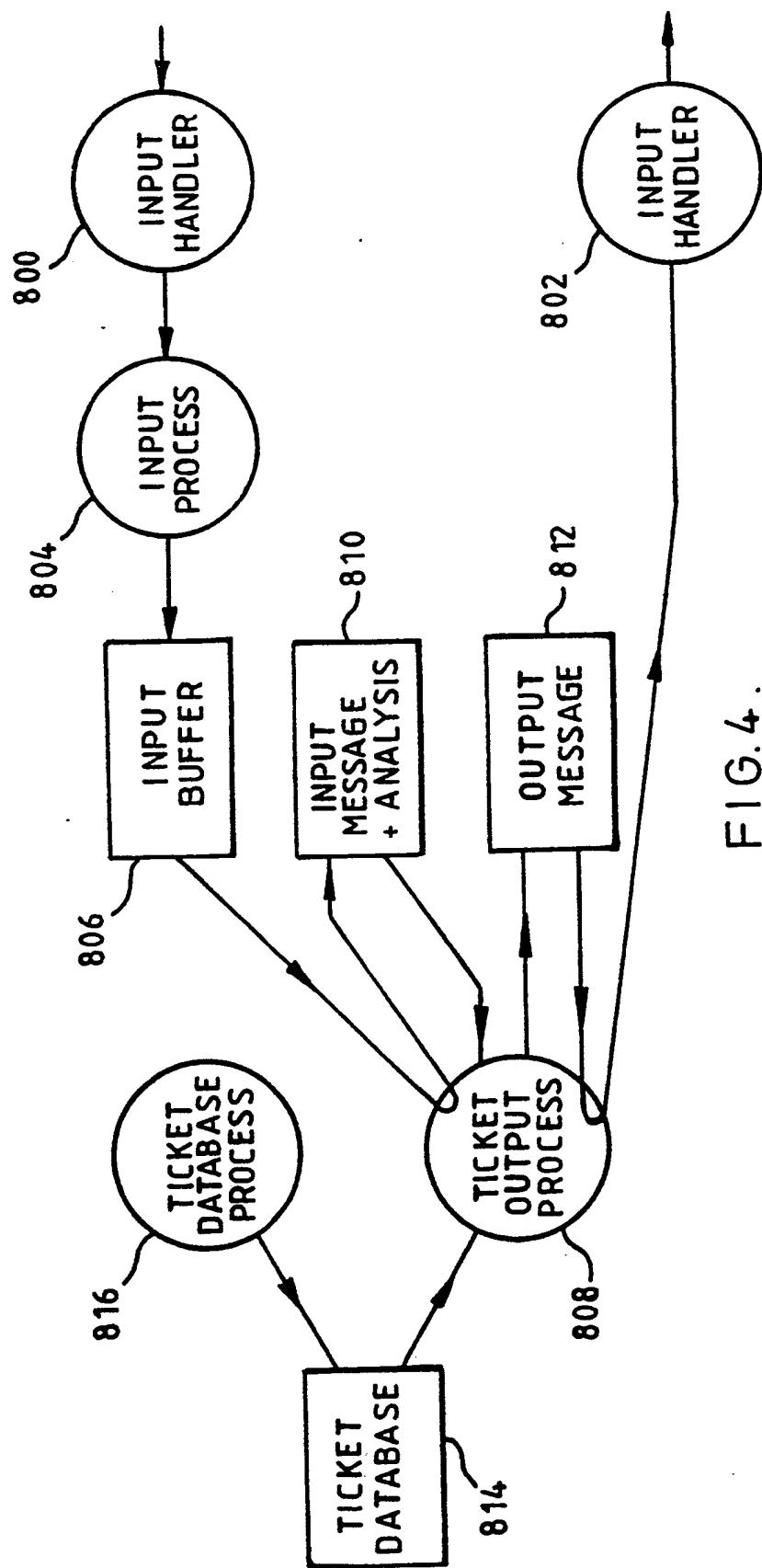


FIG. 4.

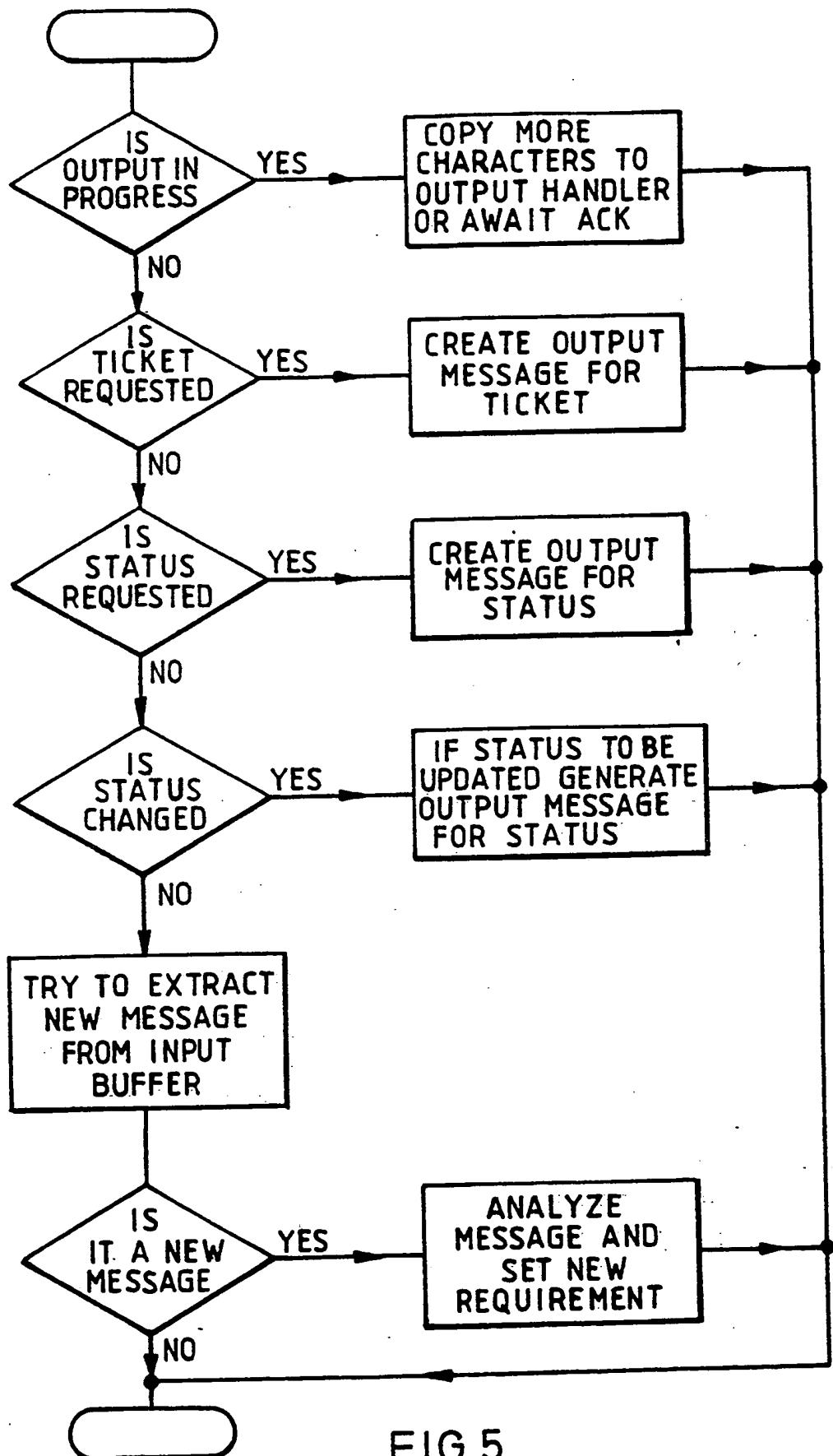


FIG.5.

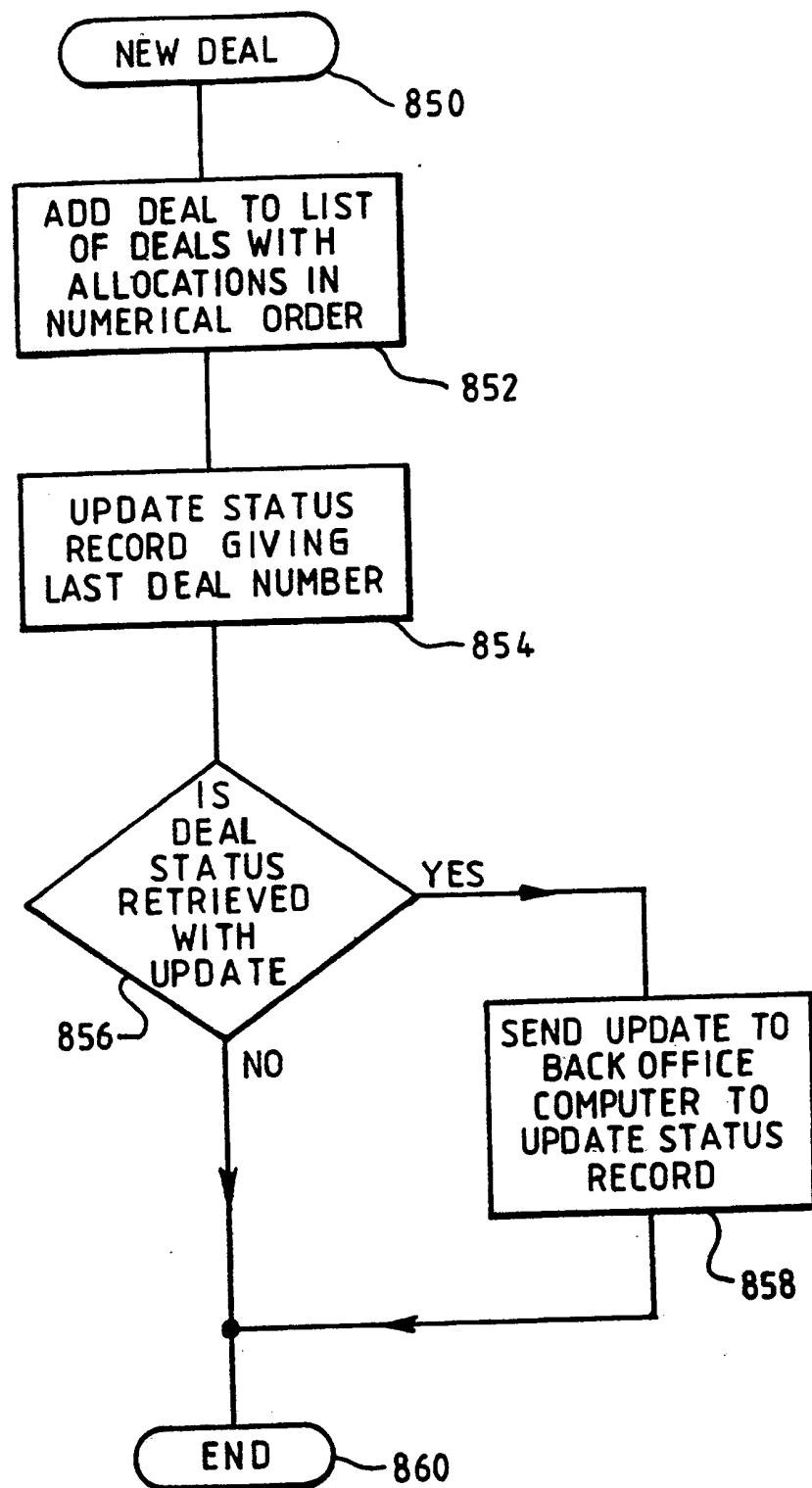
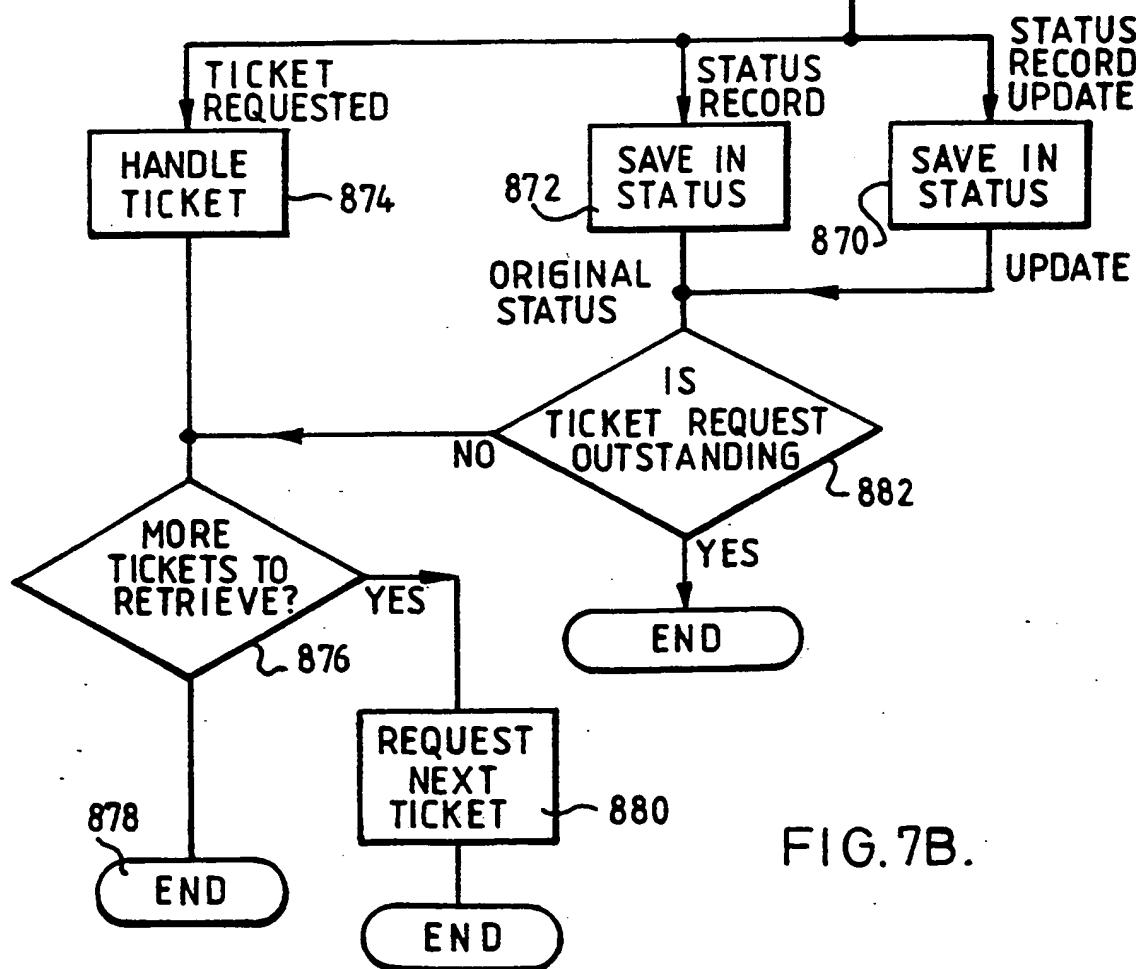
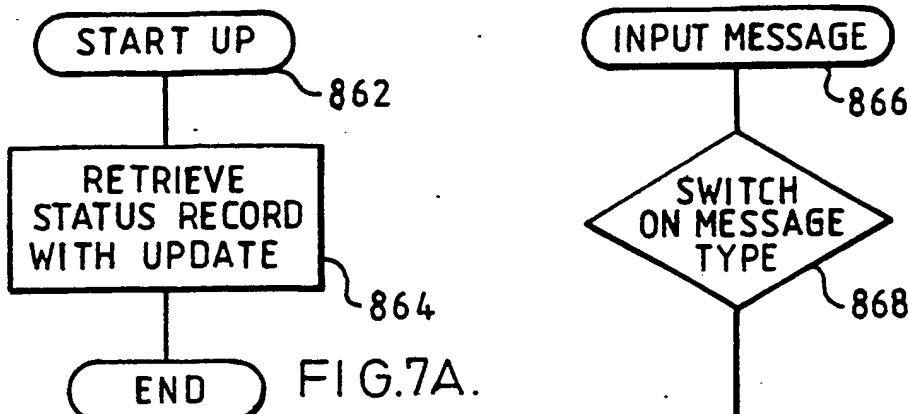


FIG.6.

BACK OFFICE COMPUTER

REQUEST FOR TICKETS RECEIVED  
BY DATABASE SERVER

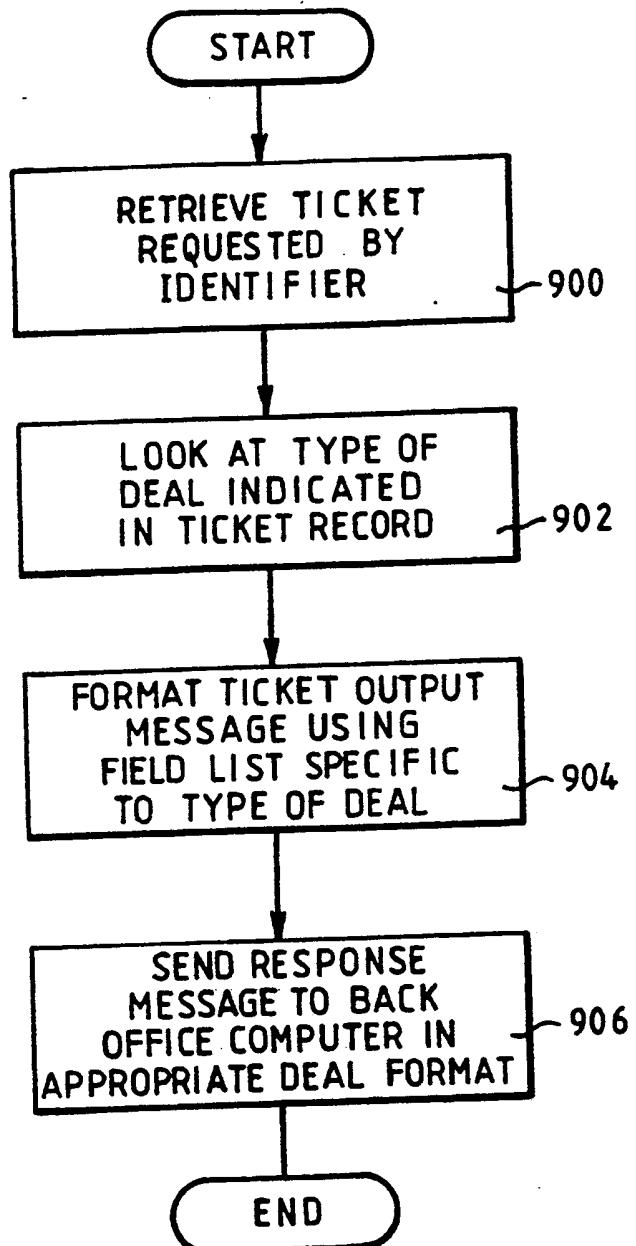


FIG.8.

TICKET REQUEST  
TO DATA BASE SERVER 416  
(SNAPSHOT REQUEST)  
<FS> 333 <US><Tag><GS><Alpha-Name><FS>

FIG.9.

RECORD RESPONSE TO BACK OFFICE COMPUTER 401  
<FS> 340<US><Tag><GS><Alpha-Name><US><Field-List-No><US><RTL>  
{<RS><Field-ID><US><Field-Value>}n <FS>

FIG.10.

STATUS REQUEST  
TO DATA BASE SERVER 416  
(DATE AND UPDATES REQUEST)  
<FS> 332<US><Tag><GS><Alpha-Name><FS>

FIG.11.

REPLY TO STATUS REQUEST SENT TO BACK  
OFFICE COMPUTER 401

<FS> 340 <US><Tag><GS>AAAA#INFO<US><Field List No><US><RTL>  
{<RS><Field-ID><US><Field-Value>}n

FIG.12.

DATA COMMUNICATION

The present invention relates to trading ticket output systems for use with high performance, information retrieval systems for financial information, and particularly to such systems for providing high speed reliability and timely reporting of trading information without continuous polling.

Information retrieval systems for financial information, such as stock market type information and money market information, normally employ a transfer of data in a high performance, real time information retrieval network in which update rates, retrieval rates and subscriber or user population are generally very high. An example of such a system is the "REUTERS DEALING SERVICE" which is used in the foreign exchange or money market. Such systems, while providing rapid video conversation capability, still require a permanent back office record of the trading transactions between dealers. This record is normally referred to as the trading ticket and is a permanent confirmation of the deal, with this information normally being stored in the back office computer at the user's site. The back office computer normally monitors all of the financial or money market trading at a given site in such a system and, in accordance with this function, rapid collection of this information in the high performance, real time information environment of modern financial trading is desirable. Thus, high speed reliable systems that can provide this information to the back office computer without continual polling of the various keystations can significantly improve the high speed reporting and data collection capabilities of the back office

computer. Commonly owned U.S. Patent No. 4, 745,559 describes methods and systems for dynamically controlling the content of a local receiver data base from a transmitted data base in an information retrieval communication network, such as an information retrieval system capable of supporting the transfer of data on a high performance, real time information retrieval basis in which update rates, retrieval rates and subscriber population are high, and refers to the adaptability of such a system to the collection of financial information, such as stock market type information and money market information. The logical data structures and protocols described therein are beneficial and overcome many of the earlier problems of the prior art, such as the various problems present in the type of systems described in U.S. Patent Nos. 4,260,854; 4,633,397; and Japanese Patent Nos. 59-89056 and 60-144050. However, none of these prior art systems known to the applicant disclose a high speed, reliable system for providing trading ticket information to a back office computer without continual polling, such as through the use of status records, as in the present invention, or the ability to have deal tickets requested in order without concern as to the type of the deal. Co-pending Patent Application No. 8923936-2 (P11321), among other things described a system for automatically generating trading tickets rapidly by using conversation analysis. With such rapid real time generation of trading tickets, it is important that there be a high speed reliable system that can provide information about these trading tickets -----

to the back office computer without continual polling or certain of the benefits and efficiencies of the aforementioned rapid trading ticket generation could be lost in considering the overall efficiencies of the system. These disadvantages of the prior art are overcome by the present invention.

A trading ticket output communication system for communicating trading ticket output information relating to a plurality of different type confirmed trading transactions from one or more uniquely identifiable local ticket data bases at which the trading ticket output information is initially collected to a remote back office data base is disclosed in which trading tickets may be requested from a local data base in order of confirmation of trading transaction independent of the type of trading transaction involved. The invention is described, by way of example, with respect to the money market in which the various types of trading transactions comprise single deals, such as spot or outright deals, swap deals, and deposit deals. Each of these types of deals has an associated field list which uniquely defines the transmission format of the information although the request for the information is by a unique ticket identifier which is independent of the type of trading transaction and comprises the unique identification of the local data base, which is the associated terminal controller and the sequential number corresponding to the order of

confirmation of each of the trading transaction at the particular local data base. The local data base also stores a status record corresponding to the trading ticket record content of the local data base, which record changes with each change in the number of confirmed trading transaction records at the local data base. By requesting this status record with automatic updates, the remote back office computer can be advised that additional confirmed trading transactions have occurred and can request updates without the need for continual polling.

FIG. 1 is an overall system functional block diagram of the conversational video system described in the aforementioned co-pending patent application modified, however, to employ a different trading ticket output system;

FIG. 2 is a functional block diagram of a typical conversation analyzing terminal controller usable in the system of FIG. 1, containing a data base server capable of communicating with a back office computer in accordance with the trading ticket output system of Fig. 1;

FIG. 3 is a functional block diagram of a typical foreign exchange dealing communication network, such as the communication network disclosed in commonly owned U.S. Patent No. 4,525,779, usable in the system of FIG. 1;

FIG. 4 is a diagrammatic illustration of a portion of the trading ticket output system of FIG.1 concerned with the ticket output protocol;

FIG. 5 is a diagrammatic flow chart of the presently preferred ticket output process in accordance with the trading ticket output system of FIG. 1;

FIG. 6 is a diagrammatic flow chart of the operation of the terminal controller when a new trading ticket has been generated in accordance with the trading ticket output system of FIG. 1;

FIGS. 7A and 7B are diagrammatic flow charts of the operation of the back office computer in connection with the use of status records in order to avoid the need for continuous polling;

FIG. 8 is a diagrammatic flow chart of the operation of the data base server with respect to requests for tickets received by the data base server from the back office computer;

FIG. 9 is a diagrammatic representation of a typical snapshot ticket request to the data base server from the back office computer;

FIG. 10 is a diagrammatic illustration, similar to FIG. 9, of a typical record response to the back office computer from the data base server in response to the ticket request of FIG. 9;

5 FIG. 11 is a diagrammatic illustration, similar to FIG. 9, of a data and updates status request to the data base server from the back office computer; and

10 FIG. 12 is a diagrammatic illustration, similar to FIG. 10, of a reply to the status request of FIG. 11 which is sent to the back office computer.

Referring now to the drawing in detail, and initially to FIGS. 1-3, the overall conversational video system described in co-pending Patent Application No. 8423937-0 (P11320) is shown. However, the system of FIGS. 1-3 has preferably been modified to illustrate a back office computer 401, 401a, such as a conventional computer capable of communicating with the data base server 416 comprising a part of the conversational analyzing terminal controller 400, 400a. For the sake of clarity, the same reference numerals have been employed herein for like functioning components of FIGS. 1-3, which are common to FIGS. 1-3 of the aforementioned co-pending patent application. As was

explained, therein, the system of FIGS. 1-3 employs real time conversation analysis to, among other things, enable the preparation of Dealing tickets in real time while the deal is being arranged through the use of what are commonly called artificial intelligence techniques to analyze the dealing dialogue and generate the ticket. Thus, the system of FIGS. 1-3 is what is commonly termed an expert type of system. Of course, although the system is described by way of example with respect to foreign exchange dealing, it may be used in connection with any type of high performance system in which trading tickets are generated. As was also explained in the aforementioned copending patent application, the system of FIGS. 1-3 can also be used for data capture of offline deals as well, which offline deals also result in the creation of tickets usable with the trading ticket output system of the present invention. Thus, the system of the present invention is not concerned with whether the input was due to an online deal or an offline deal as long as the trading ticket information has been provided to the data base server 416.

Apart from the conversation analysis function and the analysis driven ticket generation and associated features described in the aforementioned copending patent application, and the trading ticket output system of the present invention, the present system is substantially similar to other conversational video systems developed by u s and described in commonly-owned U.S. Patent Nos. 4,525,779; 4,388,489; 4,531,184; and the commonly-owned

co-pending patent application  
No. 8923937-C (P11320), although the present  
invention need not be limited to a conversational video system  
as long as there is a local data base record of trading tickets  
for communication to a back office data base. For purposes of  
completeness, before describing the trading ticket output system  
of the present invention with reference to FIGS. 4-11, we shall  
briefly describe the system of FIGS. 1-3 so that it can be  
understood within the context of the present invention.

As shown in FIG. 1, by way of example, which is a  
functional block diagram of the overall system of the present  
invention, the block labeled "Typical Dealing Communication  
Network", generally referred to by reference numeral 300, and  
illustrated in greater detail in FIG. 3, is basically the same  
type of communication network as illustrated in FIG. 13J, by way  
of example, of U.S. Patent No. 4,525,779 and the same reference  
numerals have been used in FIG. 3 as are used in U.S. Patent No.  
4,525,779 for like functioning components such as for the  
concentrators 48 and 110, for the nodes 44 and 42, for the host  
computer 38, and for the storage device 204. Of course, other  
packet switching communication networks could be employed, if  
desired, in place of network 300. By way of comparison of the  
overall system functional block diagram of FIG. 1 with that of  
FIG. 13J of U.S. Patent No. 4,525,779, by way of example, it can  
be seen that the terminal controller 96, shown in FIG. 13J of  
U.S. Patent No. 4,525,779 is preferably replaced by the  
conversation analyzing terminal controller 400 or 400a of the

present invention which enables real time conversation analysis of the video conversations between, for example, a New York Maker 98a and a London Taker 602 and the provision of real time automatic generation of tickets based on such conversation. In addition to the conversation printer, such as printer 102, 102a, and 604a, there are preferably ticket printers 404, 406, by way of example, which enable the printing of Dealing tickets based on the aforementioned real time conversation analysis, as will be described in greater detail hereinafter. In addition, the user terminals or keystations illustrated in FIG. 1 are shown as also having a conventional mouse 408, such as the mouse described in the co-pending Patent Application No. 8923937-C (P11320) such as for providing the fast contact feature disclosed therein. Of course, if desired, the mouse 408 may be omitted. Moreover, as shown by way of example in FIG. 1, both parties to a conversation need not have a conversation analyzing terminal controller, such as 400 or 400a and one of the parties may have a terminal controller such as the type of controller 96, by way of example, described in U.S. Patent No. 4,525,779, in which instance that party will not have the benefit of real time conversation analysis to provide, for example, context sensitive or analysis driven prompts, or automatic ticket generation, or inconsistency notification, based on such real time conversation analysis. If that party wished those benefits, then a conversation analyzing terminal controller such as controller 400 would preferably be employed in place of the previous terminal controller 96. The data display terminals or video

monitors or screens 410 illustrated in FIG. 1, which are conventional video monitors, having associated keyboards 412, provide the appropriate screen displays of the video conversations as well as the trading ticket being generated.

The presently preferred conversation analyzing terminal controller 400 or 400a is illustrated by way of example in FIG. 2. As shown and preferred in FIG. 2, the conversation analyzing terminal controller 400, 400a, preferably includes a line server 414, a local data base server 416 which communicates with the back office computer 401 such as to provide a record of the tickets generated by the keystations associated with the terminal controller 400, and a conversation analysis server 418, all of which are preferably 80386 computers, such as COMPAQ 80386 based computers. In addition, as also shown and preferred in FIG. 2, the conversation analyzing terminal controller 400, which can preferably serve a plurality of terminals, such as up to 12, by way of example, includes an 80386 based terminal computer 420, 420a, for each keystation associated with the conversation analyzing terminal controller 400, with one output to the screen or video display 410 and the other output to the keyboard 412 from the terminal computer 420, 420a. The various computers 414, 416, 418, 420 and 420a are preferably tied together in a conventional local area network 421 so as to permit communication between appropriate ones of the various computers 414, 416, 418, 420,

420a in accomplishing the conversation analysis, context sensitive prompts, inconsistency alert, and automatic ticket generation functions of the present invention, with the data base server 416 preferably being tied to the back office computer 401. The line server 414 preferably serves as an interface between the terminal computers 420, 420a and the appropriate concentrator 48 or 110, in the communication network 300. The data base server 416 preferably stores conversations and completed Dealing tickets and provides this information to the ticket printer 404 or 406 and to the conversation printer 102a or 604a, as well as to the back office computer 401, in accordance with the present invention. The conversation analysis server 418 preferably stores the conversation analysis software, such as the software of Table B annexed to the aforementioned copending U.S. patent application incorporated by reference herein. The analysis server 418 preferably analyzes the conversation in real time and provides appropriate context sensitive or analysis driven prompts to the Maker or Taker's screen, depending on whom the conversation analyzing terminal controller 400 or 400a is associated with at the time, provides Dealing tickets to the data base server 416 associated with it, and alerts the user to inconsistencies in the conversation by providing such alerts to the screen 410.

The conversation analysis software, which is contained by way of example in Table B annexed to the co-pending Patent Application No. 8923936.2 (P11321) and the context sensitive prompt or prompt menu selecting software which is contained in

Table A, also annexed thereto, are preferably written in C language for use with an 80386 computer, with the communication itself between two counterparties being referred to herein as a conversation. Preferably, this system is employed in connection with foreign exchange trading, although, as previously mentioned, it is not so limited. Although in the example of FIG. 2, three separate servers 414, 416 and 418 are shown, these servers can be combined into a single computer, if desired, with each keystation still being supported by a dedicated terminal computer 420, 420a, and with, as previously mentioned, these keystation computers 420, 420a being linked to the servers 414, 416 and 418 by a conventional local area network 421.

Preferably, communication over the local area network 421 uses a virtual connection such as provided by the MS-NET standard variant. In addition, preferably, all of the data about each conversation in progress, such as up to 24 such conversations for a given conversation analyzing terminal controller 400 by way of example, is held in a global array with each element in this array pointing to a structure of type CONVDATA in accordance with the software given by way of example in the aforementioned Table B. This is a type which holds the various network handles associated with the conversation, the text buffer for the conversation, and so on. It also preferably includes an element identified as SAVEDDATA of type ANALYSISDATA, which is used to store the state of the conversation analysis. The conversation analysis is driven by the receipt of packets of text from the various keystations. These successive chunks of text arrive in ANALYZE TEXT PACKETS

which are directed to the correct procedure by the environment, which has been informed of the destination of the input messages by a call to NetRegisterReply in the procedure Ov-main in section caserver.c in the aforementioned software of Table B.

The incoming packets of text are directed to the procedure fn ReplyAnalysisMessages in the section camesage.c. When an ANALYSE TEXT packet is received for a conversation, (Current Conv) is set to point to the CONVDATA structure for the appropriate conversation, and the saved analysis state and ticket are preferably copied into the working areas pointed to by the globals (Ticket) and (Analysis Data). Then the procedure ReplyAnalyseText in the section camesage.c of the aforementioned Table B is called to check the request. If appropriate, the analysis is initialized. This happens when text is deleted, for example, by an interrupt. When new text is added to the conversation, the C library procedure setjump of Table B is called to store the current C context for the longjump return from parsing described in my copending U.S. patent application incorporated by reference herein. This call to setjump returns to zero, and then the parsing routine parse of Table B is preferably called to analyze the conversation from the last saved state. When the parsing is terminated by reaching the end of the text currently held, the longjump call returns to the point at which setjump was called with a non zero reply, and the analysis is wrapped up by notifying the keystation of any change to the analysis. Preferably, the conversation analysis, exemplified by Table B, always starts on the parse procedure.

In the aforementioned parse procedure, if no previous conversation analysis has been done, the analysis state is initialized.

Preferably, there is then a check to see if the type of deal is known since the system is capable of analyzing a plurality of different types of deals, such as, by way of example, a spot deal, an outright deal, a swap/forward deal, and a deposit deal. A spot deal as used herein is one in which one party buys a specified amount of currency X from the other party, paying him in currency Y at a specified exchange rate, with the deal taking place on the spot date. A spot date is normally two working days time, but could be today or tomorrow. An outright deal as used herein is one which is similar to a spot deal except that the deal takes place on a specified future date. Future dates are either standard dates, which can be determined from a conventional statement, such as "3 months", or specific dates, which are known as broken dates. A swap/forward deal as used herein is one which is equivalent to a spot deal plus a subsequent outright deal the other way around for the same amount, or to two outright deals for the same amount, different ways around, but on different dates. For example, dealer A may agree to buy one million dollars worth of francs from dealer B on the spot date and three months later sell him back one million dollars worth of francs. The number of francs involved will normally be different in the two deals because the rates will be different. In the normal forward deal as used herein, the first of the two transactions will be at spot. A

forward/forward deal as used herein is when both transactions are for forward dates. An overnight deal as used herein has one transaction today and the second on the next trading day. A tomorrow/next deal as used herein has the first transaction on the next trading day. Lastly, a deposit deal as used herein is one in which one party deposits a specified amount of a specified currency with the other party for a specified period at a specified interest rate.

If the type of deal is not known, the conversation is preferably parsed until the type of deal can be deduced. Once the type of deal is known, the information extracted during the parse is preferably pruned of data incompatible with the type of deal, and then the conversation is preferably reexamined by a parsing procedure that assumes that the type of deal has been determined. The deal specific parsing is then preferably expected to continue as long as the conversation runs; however, that deal assumption may be contradicted by a clear indication that the conversation is about a different type of deal. In such a case, the information extracted is preferably again pruned to correspond to the new type of deal and then further parsing is done assuming the new type of deal. However, in this instance the parse does not restart from the beginning of the conversation but continues from the current point.

As was previously mentioned, tickets are preferably created as the system extracts information by analyzing conversations, with the

display of the ticket being generated appearing on the screen 410. Preferably, only one analysis can be associated with one conversation and, after a user confirms the analysis of the current conversation, a ticket can be printed on the ticket printer 404 or 406 depending on whether it is the Market Maker or the Market Taker, respectively, when the conversation is next terminated or printed and is stored in the data base server 416. Preferably, the ticket printer 404, 406 is a separate printer with the same characteristics as the conversation printer 102a, 604a; namely, it accepts serial data and it prints on continuous paper. As a conversation takes place, the associated conversation analysis area on the screen 410 preferably shows a summary of the analysis information, which, if desired, can become a fully expanded version of the current analysis which is then displayed on the screen 410. When the conversation is terminated and saved, preferably the analysis is saved with it. Preferably

conversations and analyses are saved and deleted only as more storage is required.

Before a conversation analysis can be confirmed in the system of the present invention, preferably it must contain at least the following information about the deal: the deal type, the deal direction, the currency or currencies, the amount, the rate or rates, and the value date. Thereafter, the user can confirm the conversation analysis by pressing the CONFIRM key. Preferably, once an analysis has been set into the confirming mode, the next time the conversation is ended on the dealer's

screen 410, a ticket is printed and stored on the data base server 416. Thereafter, the conversation cannot be edited any further. Preferably, in the system of the present invention, a confirmed analysis cannot be marked as cancelled or wrong and, therefore, the only way to cancel the effect of a confirmed deal is to enter a compensating deal by an offline conversation. If the analysis has not been confirmed, it can then be marked as cancelled or wrong at any time during a real or offline conversation or when wrapping up a conversation by pressing the CANCEL or WRONG keys. An analysis marked as cancelled can be changed to wrong and vice versa, and an analysis marked as cancelled or wrong can be confirmed. As was previously mentioned, in the preferred system of the present invention, the way to generate a ticket on the ticket printer 404, 406, is by setting the conversation being analyzed to the CONFIRMING state which ends the analysis.

I t s h o u l d b e n o t e d  
t h a t the conversation summary analysis which ultimately results in the generated ticket is updated during the course of the dialogue or conversation and provides additional visual feedback to the dealer. The conversation summary analysis on the screen 410 preferably contains or displays information such as the type of deal, the analysis status, the period, the volume and volume currency, the rates and currencies involved, the value dates, and whether all payment instructions on each side have been entered. If this analysis finds inconsistent data, as previously mentioned, the fields concerned in this display are preferably highlighted to alert the user.

With respect to the analysis status, there are preferably seven areas of analysis which are preferably indicated in the display area. These various analysis status indications are NO DEAL where the system does not think there has been a deal, INCOMPLETE where the system thinks there has been a deal but has not been able to extract all the details needed for the analysis to be confirmed, EXTRACTED where the system thinks there has been a deal and has extracted sufficient details needed for the analysis to be confirmed, CONFIRMING where the dealer has confirmed the analysis but the conversation has not been ended or printed, CONFIRMED where the dealer has confirmed the analysis and the relevant part of the conversation has been ended and sent for printing, CANCELLED where the dealer has marked the analysis as cancelled, and WRONG where the dealer has marked the analysis as wrong. When a conversation starts the status is NO DEAL with the subsequent events causing it to change. Thus the status changes from NO DEAL to INCOMPLETE when the conversation analysis finds a line which it understands as a deal, such as a line which specifies an amount if being bought or sold. The analysis status then changes from INCOMPLETE to EXTRACTED when the conversation analysis finds the last piece of information it needs to allow the analysis to be confirmed. The analysis then changes from EXTRACTED, CANCELLED, or WRONG, to CONFIRMING, when the dealer has pressed CONFIRMED and the analysis has sufficient relevant information for the deal to be confirmed. The analysis status changes from CONFIRMING to CONFIRMED when the dealer terminates the conversation or presses the PRINT key. The analysis status changes from EXTRACTED to

INCOMPLETE or NO DEAL when the system receives information from the counterparty indicating that some of the relevant text has not been received or has been backed out by an interrupt, which is normally indicated to the dealer as an interrupt or as a fault in the conversation. In order to change the analysis status to CANCELLED, the dealer presses the CANCELLED key from any status except CONFIRMED. This is also true with respect to changing the analysis status to WRONG. This is accomplished by the dealer pressing the WRONG key from any status, except CONFIRMED, to WRONG.

p r e s s i n g t h e

TICKET key causes the expanded analysis display mode to be entered or stored in the data base server 416. As was previously mentioned, in this mode, the expanded analysis for the current conversation is displayed on the screen 410. The expanded analysis preferably shows the full contents of all the fields that can appear in the analysis except that payment instructions may, if necessary, be truncated. In the case of forward deals, preferably the information for both value dates is shown, requiring four transactions. While in expanded analysis display mode, the expanded analysis on display is preferably kept up-to-date with the conversation. Swapping between two conversations would automatically preferably swap between the two expanded analyses so that the one for the current conversation was always visible. The expanded analysis display mode preferably remains in effect until a different use of this display area is requested. Preferably, if a printout of

the conversation analysis is requested, the output on the conversation printer 102a, 604a is similar to that of the displayed window, although the payment instructions may be moved to a separate line if desired. With respect to printing a ticket with the ticket printer 404, 406, the format of the ticket is preferably similar to the expanded analysis, however the order of the information may be changed to present the more critical information first. Of course, although the creation and storage of a ticket has been described in terms of the real time conversation analysis system of the aforementioned copending patent applications, such a system is not necessary with a local data base storage of trading tickets irrespective of how these trading tickets are dynamically created.

Now referring to FIGS. 4-11, the preferred trading ticket output system employing the presently preferred ticket output protocol and process will be described for handling the transfer of trading ticket information between the local data base server 416 and the back office computer 401. In this regard, with reference to U.S. Patent No. 4,745,559, the local data base server 416 of the present invention is analogous to the local data base described in U.S. Patent No. 4,745,559, except, as will be described in greater detail hereinafter, there are various differences as it relates to the presently preferred ticket output protocol and process of the present invention. Although, the preferred ticket output protocol preferably employs field

identifiers or FIDs which are analogous to the field identifiers referred to in the aforementioned U.S. Patent No. 4,745,559, the information contained therein is totally different. In place of the record identifier codes or RICs referred to in the aforementioned U.S. Patent No. 4,745,559, the ticket output protocol process of the present invention preferably employs unique deal identifiers which correspond to the ticket number on the printed deal ticket as well as to the conversation analyzing terminal controller 400 which contains the local data base server 416 containing that record. Thus, the deal or trading ticket identifier includes the terminal controller identifier as well as a ticket number, with deals preferably being given sequential numbers in order of their confirmation. The sequence is preferably in the range of 1 - 999999, by way of example for each terminal controller 400. The deal identifier preferably starts with the terminal controller identifier and a # and is followed by the sequential number, such as, for example, AAAA#123456 for deal number 123456 on terminal controller AAAA. In addition to retrieving the deal per se, the status of the data in the terminal controller system can also preferably be retrieved using the terminal controller identifier AAAA#INFO, by way of example.

Preferably, as will be described in greater detail hereinafter, the data base server 416 can supply two kinds of data to be retrieved about the deals being conducted by the keystations associated with that terminal controller 400; namely information on a deal, and status information on what is stored

in the data base. As will be described in greater detail hereinafter, it is the updates from the status record which are preferably looked at to see if there is a change in status indicating that a new trade has arrived, which permits rapid transfer of trading information, such as the trading tickets, without the need for continuous polling of the various terminal controllers 400, 400a. It should be noted that each terminal controller 400, 400a keeps its own unique record of deals and has its own unique set of deal identifiers which are independent of the other terminal controllers 400, 400a associated with the back office computer 401, assuming more than one terminal controller is associated therewith, since a portion of the record identifier is the unique identification of the terminal controller 400, 400a itself. A data record associated with a terminal controller identifier or TCID, is preferably a collection of data items with each data item being assigned a unique Field Identifier Number or FID. The presently preferred ticket output protocol preferably uses the FID number to identify each data item within a message. Preferably, records in the system are grouped into classes, such as for a deposit deal, or a swap deal or a single deal, such as a spot or outright deal, with each class preferably relating to a set of FIDs called a Field List. The Field List is analogous to a template except that it relates to the format of the transmission of the data as opposed to the display *per se*, with the Field List defining which collection of data items will be received for that class of record. This Field List is preferably contained in the record response of the data base

server 416 to the request of the back office computer 401 for trading ticket information, such as illustrated in FIG. 10 by way of example.

Since single deals such as spot or outright deals; swap deals; and deposit deals have certain characteristics unique from each other, unique field identifiers must preferably be provided to distinguish these type of deals in the preferred ticket output protocol. An example of these unique field identifiers with respect to spot and forward and outright deals is shown below in Table A.

TABLE A

Field List Name: SINGLE DEAL

Field List Number: 501

<u>ACRONYM</u>	<u>FID</u>	<u>FIELD TYPE</u>	<u>LENGTH</u>
SOURCE	500	ENUMERATED	1
REFERENCE	501	ALPHANUMERIC	8
DEAL_DATE	502	DATE	11
DEAL_TIME	503	TIME	8
DEALER_ID	504	ALPHANUMERIC	6
CONFIRM_DATE	505	DATE	11
CONFIRM_TIME	506	TIME	8
CONFIRM_ID	507	ALPHANUMERIC	6

<b>BANK_CODE_1</b>	508	ALPHANUMERIC	4
<b>BANK_NAME_1</b>	509	ALPHANUMERIC	56
<b>BROKER_CODE</b>	510	ALPHANUMERIC	4
<b>BROKER_NAME</b>	511	ALPHANUMERIC	56
<b>BANK_NAME_2</b>	513	ALPHANUMERIC	56
<b>DEAL_TYPE</b>	514	ENUMURATED	1
<b>PERIOD_1</b>	515	ENUMERATED	3
<b>CURRENCY_1</b>	517	ALPHANUMERIC	3
<b>CURRENCY_2</b>	518	ALPHANUMERIC	3
<b>VOLUME_1</b>	519	INTEGER	15
<b>EXCH_RATE_1</b>	522	PRICE	12
<b>DIRECTION</b>	524	ENUMERATED	1
<b>VALUE_DATE_1</b>	525	DATE	11
<b>VALUE_DATE_2</b>	526	DATE	11
<b>PAYMENT_1</b>	529	ALPHANUMERIC	56
<b>PAYMENT_2</b>	530	ALPHANUMERIC	56

These unique field identifiers as they relate to swap deals is shown below by way of example in Table B.

**TABLE B**

**Field List Name:** **SWAP DEAL**

**Field List Number:** **502**

<u>ACRONYM</u>	<u>FID</u>	<u>FIELD TYPE</u>	<u>LENGTH</u>
SOURCE	500	ENUMERATED	1
REFERENCE	501	ALPHANUMERIC	8
DEAL_DATE	502	DATE	11
DEAL_TIME	503	TIME	8
DEALER_ID	504	ALPHANUMERIC	6
CONFIRM_DATE	505	DATE	11
CONFIRM_TIME	506	TIME	8
CONFIRM_ID	507	ALPHANUMERIC	6
BANK_CODE_1	508	ALPHANUMERIC	4
BANK_NAME_1	509	ALPHANUMERIC	56
BROKER_CODE	510	ALPHANUMERIC	4
BROKER_NAME	511	ALPHANUMERIC	56
BROKER_NAME_2	513	ALPHANUMERIC	56
DEAL_TYPE	514	ENUMERATED	1
PERIOD_1	515	ENUMERATED	3
PERIOD_2	516	ENUMERATED	3
CURRENCY_1	517	ALPHANUMERIC	3
CURRENCY_2	518	ALPHANUMERIC	3
VOLUME_1	519	INTEGER	15
SWAP_RATE	521	ALPHANUMERIC	12
EXCH_RATE_1	522	PRICE	12
EXCH_RATE_2	523	PRICE	12
DIRECTION	524	ENUMERATED	1

VALUE_DATE_1	525	DATE	11
VALUE_DATE_2	526	DATE	11
VALUE_DATE_3	527	DATE	11
VALUE_DATE_4	528	DATE	11
PAYMENT_1	529	ALPHANUMERIC	56
PAYMENT_2	530	ALPHANUMERIC	56
PAYMENT_3	531	ALPHANUMERIC	56
PAYMENT_4	532	ALPHANUMERIC	56

These unique field identifiers as they relate to deposit deals is shown below by way of example in Table C.

TABLE C

Field List Name: DEPOSIT DEAL

Field List Number: 503

<u>ACRONYM</u>	<u>FID</u>	<u>FIELD_TYPE</u>	<u>LENGTH</u>
SOURCE	500	ENUMERATED	1
REFERENCE	501	ALPHANUMERIC	8
DEAL_DATE	502	DATE	11
DEAL_TIME	503	TIME	8
DEALER_ID	504	ALPHANUMERIC	6
CONFIRM_DATE	505	DATE	11
CONFIRM_TIME	506	TIME	8
CONFIRM_ID	507	ALPHANUMERIC	6

<b>BANK_CODE_1</b>	508	ALPHANUMERIC	4
<b>BANK_NAME_1</b>	509	ALPHANUMERIC	56
<b>BROKER_CODE</b>	510	ALPHANUMERIC	4
<b>BROKER_NAME</b>	511	ALPHANUMERIC	56
<b>BROKER_NAME_2</b>	513	ALPHANUMERIC	56
<b>DEAL_TYPE</b>	514	ENUMERATED	1
<b>PERIOD_1</b>	515	ENUMERATED	3
<b>PERIOD_2</b>	516	ENUMERATED	3
<b>CURRENCY_1</b>	517	ALPHANUMERIC	3
<b>VOLUME_1</b>	519	INTEGER	15
<b>DEPOSIT_RATE</b>	520	PRICE	12
<b>VALUE_DATE_1</b>	525	DATE	11
<b>VALUE_DATE_2</b>	526	DATE	11
<b>PAYMENT_1</b>	529	ALPHANUMERIC	56
<b>PAYMENT_2</b>	531	ALPHANUMERIC	56

Preferably, requests for the status of the deal or trading ticket data base contained in the local data base server 416 of a particular terminal controller 400 will provide information to the back office computer 401 on the earliest and latest deal identifiers stored at the local data base server 416, with the date and time of the trading tickets. This information would permit the back office computer 401 to determine the range of trading tickets available for retrieval.

An example of a Deal Status Field List is given below in Table D by way of example.

TABLE D

Field List Name: DEAL\_STATUS

Field List Number: 500

<u>ACRONYM</u>	<u>FID</u>	<u>FIELD TYPE</u>	<u>LENGTH</u>
OLD DEAL ID	533	ALPHANUMERIC	11
OLD DEAL DATE	534	DATE	11
OLD DEAL TIME	535	TIME	8
NEW DEAL ID	536	ALPHANUMERIC	11
NEW DEAL DATE	537	DATE	11
NEW DEAL TIME	538	TIME	8

Preferably, all fields within the messages transmitted between the local data base server 416 and back office computer 401 contain ASCII characters which makes them suitable for display on a video terminal with little or no additional formatting, thus making the data feed of the present invention ideal for quick implementation in a data display system. In this regard, as illustrated in FIGS. 9-11, standard ASCII control characters are employed in the trading ticket requests and records of responses between the local data base server 416 and the back office computer 401. These control characters are FS, which represents the file separator character; GS, which

represents the group separator character; RS, which represents the record separator character; and US, which represents the unit separator character. Preferably, the trading ticket protocol of the present invention uses file separators at each end to delineate the beginning and end of an information message frame. As can be noted by reference to FIGS. 9-11, there is a field labeled "Tag". What this refers to is the unique identification assigned to each message by the back office computer 401 so that it can match the record response from the local data base server 416 with the request. Preferably in the trading ticket output protocol of the present invention all fields in a Field List must be present with a single space character being provided in the field if the information for a field is not available. In this manner, the presently preferred ticket output protocol of the present invention allows many fields to be empty.

With respect to the aforementioned deal data base status request, which is preferably in the form in the above example of AAAAA#INFO, a typical reply to such a request is illustrated in FIG. 12. With respect to the record shown by way of example in FIG. 12, the "Tag" reflects that of the request by the back office computer 401, as previously mentioned, and the Field ID and Field Value options can be, by way of example, the oldest deal identifier, the oldest deal date, the oldest deal time, the latest deal identifier, the latest deal date, and the latest deal time. Thus, as can be seen in the response of FIG. 12, as well as in the response of FIG. 10, each field identifier has

associated with it a field value, with the field identifier being determined by the Field List or transmission template which is unique to the type of deal. However, it should be noted, that the requests by the back office computer 401 are not by type of deal but rather are by deal identifier irrespective or independant of the type of deal. It is when the requested record is retrieved from the local data base that the record response to the back office computer 401 contains the type of deal and it's associated information. Thus, the trading ticket requests by the back office computer 401 are transparent to the type of deal. In addition, by sending out a status request so that the back office computer 401 can update it's status record, a determination can be made that another trade has occured if there is a change in the status record and a request can then be made for any records which were not previously retrieved. Thus, if a specific trading ticket is requested, the data is preferably provided but not updated, since ticket data, which is a confirmation of a deal, cannot be changed. However, the status data can be retrieved for update and so a revised version of the status data is preferably supplied whenever the status changes. In this regard, the status data may be read as a snapshot request at intervals and then any new trading tickets retrieved if the status has changed; or it may be read with an update request and, when an update is received indicating that one or more new trading tickets is ready, the new trading ticket data from that terminal controller 400, 400a can then be retrieved. Preferably, the method of the present invention using the update is employed as it appears to provide a faster response.

Referring now to FIG. 11, a typical format for a data and updates request for a trading ticket to the data base server 416 from the back office computer 401 is shown. As was previously mentioned, the original "Tag" is returned to the back office computer 401 with the record response with the same "Tag" also preferably being sent along with subsequent updates. FIG. 9 illustrates a snapshot request which is similar to the data and updates request of FIG. 11 except that no updates are forwarded. In the ticket output protocol system of the present invention, snapshot requests, such as shown in FIG. 9, are preferably employed for requesting trading ticket data, whereas data and updates requests, such as illustrated in FIG. 11, are employed for requesting status data. FIG. 10 illustrates the record response from the local database server 416 to the back office computer 401 in response to a trading ticket request, such as the snapshot request of FIG. 9. Although only one Field ID and corresponding Field Value are illustrated in FIG. 10, it is clear that for any given Field List, such as in the examples of Tables A - C, each Field ID associated with a given Field List and it's associated Field Value, will be contained in the actual record response from the local data base server 419 to the back office computer 401 when a request for trading ticket data is made of the terminal controller 400. Once again, as previously mentioned, this request is made without any knowledge required or used on the part of the back office computer 401 as to the type of deal for which the information is going to be supplied since this information is contained in the response record and not in the request record.

FIG. 4 diagrammatically illustrates the various portions of the trading ticket output system of the present invention concerned with the presently preferred trading ticket output protocol. Thus, a conventional serial line handler provided by the operating system is employed with, for convenience of explanation, the input and output being separately illustrated as the input handler 800 and the output handler 802. The input process 804 preferably extracts input bytes from the serial line via the input handler 800 and places them in an input buffer 806. The input buffer 806 performs the checks for input packets and checksums and can also set flags to ask the ticket output process 808 to generate the control characters ACKNOWLEDGE and NO ACKNOWLEDGE at appropriate points in the output stream. The input process 804 also preferably detects these control characters, such as ACKNOWLEDGE and NO ACKNOWLEDGE, at the appropriate points in the input stream, with the occurrence of these control characters being tested for by the ticket output process 808 when it has sent a message. The ticket output process 808 is preferably scheduled regularly and has several independent tasks, the main ones of which are preferably taking confirmed bytes from the input buffer 806 and placing them in a message buffer 810, scanning the message 810 to find the next complete message if available and, when found, checking the message. If the message is faulty, an appropriate error response is sent to the output message buffer 812. If, however, the message is valid, appropriate flags are set to request the required action. Preferably, no further messages are then

handled by the ticket output process 808 until the action is complete. If a ticket or status report is requested by an input message, then the ticket output process 808 preferably gathers the data from the ticket data base 814 and places it in the defined format, determined by the Field List, in the output message buffer 812. When a message has been assembled in the output message buffer 812, the ticket output process 808 preferably adds the appropriate control bytes and transfers it to the output handler 802, passing as many characters as the output handler 802 can accept at a time until the whole message has been transferred to the back office computer 401 from the local data base server 416. The ticket data-base process 814 is preferably modified to support updates of the status data in the ticket output protocol. The addition is preferably required when the data base is modified by the addition of a new trading ticket or the removal of an old ticket. In these cases, the ticket data base process 816 preferably sets a flag so that the update will be created by the ticket output process 808, with the flag being cleared, as appropriate, by the ticket output process 808. The ticket data-base process 816 is preferably designed so that it adds a ticket to the end of the data base 814 and obtains space as necessary by removing the earliest tickets from the beginning of the data base 814. Either of those changes alters the status of the data base 814 so that when there is a status check by the back office computer 401, the back office computer 401 is, thus, advised of the addition of a trading ticket by detecting the change in status. This is indicated to the ticket output process 808 by setting out a flag

which is cleared, when appropriate, by the ticket output process 808.

FIG. 5 further illustrates the presently preferred operation of the ticket output process 808 which, as can be seen, is entered at frequent intervals. The logic preferably gives priority to responses to requests, and handles one request at a time. A request preferably remains in the input message and analysis stage 810 until it has been answered. When any message has been created for output, preferably the ticket output process 808 is dedicated to the output of the message until it has been ACKNOWLEDGED or has been transmitted a given number of times without acknowledgment. Preferably, when no message is being output, the ticket output process 808 checks to see if an input message has requested a trading ticket. If so, the trading ticket is retrieved, a message is created according to the type of ticket by use of the Field List, and the new message is marked for output to the back office computer 401. When no ticket is being requested, the ticket output process 808 preferably checks if the status record has been requested. If so, the status data is preferably obtained and the status record is set up for output in a similar way to the trading ticket output. If, however, no status is requested, then the ticket output process 808 preferably checks to see if the status has been marked as changed by the ticket data base process 816. If a change is detected, the flag indicating the change is preferably cleared. The logic then preferably checks if the status record is currently requested in an updating mode. If

this has occurred, the new status is preferably output on the line and the ticket output process 808 creates a new status in the output message buffer 812 and then arranges that it will output the message. In the aforementioned implementation, the status record is preferably updated by retransmission of the whole status record. If none of the above conditions exist, the ticket output process 808 then preferably tries to find a complete new input message. If this succeeds, the ticket output process 808 preferably analyzes the input message. A valid message causes a change in the analysis data. The analysis of a valid message requesting data sets flags which then cause the ticket output process 808 to generate the requested output as it is rescheduled repeatedly. Other valid messages just change the current state of the analysis data, whereas invalid messages cause the ticket output process 808 to generate an appropriate error response. The above described procedure is illustrated in the flow diagram of FIG.5 .

Referring now to FIG. 6, the operation of the terminal controller 400 data base when a new trading ticket has been generated is shown. Thus, when a new deal is generated, as represented by reference numeral 850, the trading ticket corresponding to the deal is added to the list of deals with allocations of the deals or tickets being in numerical order as was previously described, such as represented by reference numeral 852. The status record is then updated, giving the last deal number, as represented by reference numeral

854, and a determination is made as to whether the deal status is being retrieved with an update, as represented by reference numeral 856. If the deal status is being retrieved with an update, the update is sent to the back office computer 401 to update the status record, such as represented by reference numeral 858, and if it is not, then the routine ends, as represented by reference numeral 860.

Referring now to FIGS. 7A and 7B, the operation of the back office computer 401, in connection with the use of status records, is illustrated. Thus, on startup, as represented by reference numeral 862, there is a retrieval of the status record with updates, as represented by reference numeral 864. The input message following the initial retrieval of the status record, as represented by reference numeral 866, causes a switch on the message type, as represented by reference numeral 868. Subsequent updates to the status record and requests for the next ticket are treated as subsequent input messages. Thus, as can be seen in FIG. 7B, the switch on message type is between the ticket requested, the status record, and the status record update, with the status record update being saved in status, as represented by reference numeral 870, as is also true for the status record, as represented by reference numeral 872. The ticket requested message, however, leads to the handling of the ticket, as represented by reference numeral 874, and a determination of whether there are more tickets to retrieve, as represented by reference numeral 876. If there are no more

tickets to retrieve, then the procedure ends, as represented by reference numeral 878. If, however, there are more tickets to retrieve, then the next ticket is requested, as represented by reference numeral 880. With respect to the status record, in both instances of the status record or the status record update, there is a determination made as to whether there is a ticket request outstanding, as represented by reference numeral 882. If there is not, then a determination is made as to whether or not there are more tickets to retrieve, as represented by reference numeral 876. However, if there is a ticket request outstanding, then this routine ends.

Referring now to FIG. 8, a flow chart is shown of the operation of the local data base server 416, with respect to requests for tickets received by the local data base server 416 from the back office computer 401. Thus, the trading ticket requested by the back office computer 401, is requested by Deal Identifier, which, as previously mentioned, does not specify the type of deal. This is represented by reference numeral 900. The type of deal indicated is then looked at in the ticket record being retrieved, as represented by reference numeral 902, and the ticket output message is then formatted using the Field List specific to the type of deal, as represented by reference numeral 904 in FIG. 8. The formatted record response message, which now contains information as to the type of deal, as well as the various parameters and values associated with them, is then sent to the back office computer 401 in the appropriate deal format, based on the Field List contained in the retrieved

record and, for the first time, the back office computer 401 finds out what type of deal was involved with the request. This is represented by reference numeral 906. It should be noted, as previously mentioned, the request by the back office computer 401 and the response to the back office computer from the local database server 416, contain a "Tag" which identifies the particular request being made.

Thus, by employing the trading ticket output protocol system of the present invention, high-speed reliable transfer of trading ticket information, without continual polling, can be provided between one or more local data base servers, associated with a group of terminal controllers, and a back office computer.

CLAIMS

1. A data communication system for communicating output information relating to a plurality of different type events from a uniquely identifiable local data base, at which said output information is initially collected, to a remote back office data base, said system comprising means for initially collecting tickets corresponding to said plurality of different type events as self-contained integral ticket records and storing said self-contained integral records at said uniquely identifiable local data base by unique identifiers corresponding to said local data base unique identification and a sequential number corresponding to the order of confirmation of each of said events at said local data base, said sequential number being independent of the type of event to which said self-contained integral record corresponds; means for requesting said self-contained integral records from said uniquely identifiable local data base for transmission to said remote back office data base in confirmed event order by unique ticket identifier independent of the type of event involved; and means for retrieving said events by said unique identifier and transmitting said self-contained integral record response to said remote back office computer data base, each of said transmitted self-contained integral record responses comprising a unique field list identification corresponding to the type of event associated with said ticket record, and one or more field identifications and associated field values corresponding to said unique field list for transmitting said requested ticket in a transmission format based on the type of event involved; whereby tickets may be requested from a local data base by the back office data base in order of confirmation of event independent of the type of event involved.

2. A communication system in accordance with Claim 1, wherein said transmitted self-contained integral record response is in the format

<FS> RR <US>XTagXGSXAlpha Name><US><Field List No.><US>

$\langle \text{RTL} \rangle \ 1 \ \{ \langle \text{RS} \rangle \langle \text{Field ID} \rangle \langle \text{US} \rangle \langle \text{Field Value} \rangle \} \ n \ \langle \text{FS} \rangle$

where FS, GS, US and RS are ASCII control characters for file separator, group separator, record separator and unit separator, respectively, RR is a unique identifier that denotes a transmission from said local data base as a record response, Tag is a unique identifier denoting the request number from the remote back office data base, and RTL denotes an event level number corresponding to the number of updates of said record.

3. A communication system as claimed in Claim 1 or Claim 2, wherein the request from said remote back office data base is in the format

$\langle \text{FS} \rangle \ X \ \langle \text{US} \rangle \ \langle \text{Tag} \rangle \ \langle \text{GS} \rangle \ \langle \text{Alpha Name} \rangle \ \langle \text{FS} \rangle$

where X is a unique identifier that denotes a request from said remote back office data base as a snapshot request or a data and updates request.

4. A communication system as claimed in any one of Claims 1 to 3 comprising a plurality of said uniquely identifiable local data bases operatively connected to said remote back office data base for communicating said output information initially collected at said plurality of uniquely identifiable local data bases to said remote back office data base as said transmitted self-contained integral record responses in response to said unique ticket identifier request, a different unique local data base identification being associated with each of said plurality of local data bases, said sequential number corresponding to said order of confirmation at a given one of said local data bases.

5. A communication system as claimed in any one of Claims 1 to 4 comprising means for retrievably storing a status record at said local data base corresponding to the record content of said local data base, said remote back office data base comprising means for requesting said status record from said local data base, said status record changing with a change in the number of event

integral records at said local data base for identifying to said remote data base that an additional event has occurred at said local data base, whereby said remote back office data base may be advised of the occurrence of events without continual polling.

6. A communication system as claimed in Claim 5 comprising a plurality of said uniquely identifiable local data bases operatively connected to said remote back office data base for communicating said output information initially collected at said plurality of uniquely identifiable local data bases to said remote back office data base as said transmitted self-contained integral record responses in response to said unique ticket identifier request, a different unique local data base identification being associated with each of said plurality of local data bases, said sequential number corresponding to said order of confirmation at a given one of said local data bases, each of said local data bases retrievably storing said status record corresponding to said local data base.

7. A data communication system substantially as hereinbefore defined with reference to the accompanying drawings.